DOCUMENT RESUME

ED 374 286 CE 067 224

TITLE	Reading Charts & Tables. E & I. Pipefitter. Millwright.
INSTITUTION	Associated Builders and Contractors, Inc., Baton Rouge, LA. Pelican Chapter.; East Baton Rouge Parish School Board, La.; Greater Baton Rouge Chamber of Commerce, LA.
SPONS AGENCY	Office of Vocational and Adult Education (ED), Washington, DC. National Workplace Literacy Program.
PUB DATE	[92]
CONTRACT	V198A10155
NOTE	183p.; For documents related to this project, see CE 067 219-251.
PUB TYPE	Guides - Classroom Use - Instructional Materials (For Learner) (051) -- Tests/Evaluation Instruments (160)
EDRS PRICE	MF01/PC08 Plus Postage.
DESCRIPTORS	Adult Basic Education; Adult Literacy; Basic Skills; Behavioral Objectives; Building Trades; *Charts; Competency Based Education; Electrical Occupations; Individualized Instruction; Instrumentation Technicians; Learning Activities; Lesson Plans; *Literacy Education; *Machine Tool Operators; Machine Tools; Mathematics Instruction; Mathematics Skills; Plumbing; *Problem Solving; Reading Skills; Tables (Data); Technical Education; Trade and Industrial Education; Word Problems (Mathematics)
IDENTIFIERS	*ABCs of Construction Project; *Millwrights; *Pipe Fitters; Workplace Literacy

ABSTRACT

Developed by the ABCs of Construction National Workplace Literacy Project, these curriculum materials for the areas of electrical and instrumentation (E&I), pipefitter, and millwright contain a lesson that deals with reading charts and tables. The lesson consists of these components: objective, instruction, 10 exercises for E&I, 5 for pipefitting, and 5 for millwright. Three types of problems are provided in each exercise: try it, apply it, and solve it. The charts to which the student is referred in the exercises are attached. The objective for the lesson is for the student to learn to use and apply information from charts. (YLB)

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ED 374 286

TECHNICAL DEVELOPMENT CENTER

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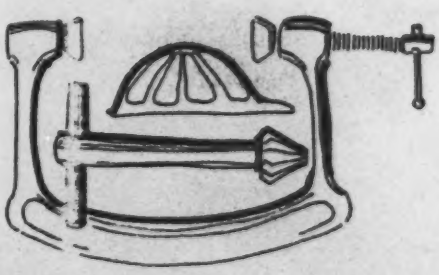
Reading Charts & Tables E & I Pipefitter Millwright

CE 067 224



Associated Builders & Contractors, Inc.
EBR Adult & Continuing Education

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ABC's of Construction

National Demonstration Project in Workforce Literacy

The ABC's of Construction Project was funded in 1991 by the U.S. Department of Education as a grantee through the National Workplace Literacy Program (PR #198A10155). The program provided basic skills instruction to industrial construction workers employed by companies which are members of the Pelican Chapter of Associated Builders and Contractors (ABC). Located in Baton Rouge, Louisiana, ABC provides training to employees of over 60 member companies who perform contract work in the 58 petrochemical facilities located along the Mississippi River between Baton Rouge and New Orleans.

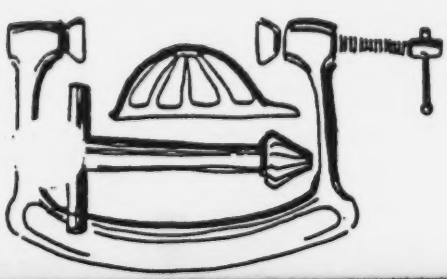
The grantee, the Adult Education Department of East Baton Rouge School Board, performed a comprehensive literacy task analysis of the apprenticeship training program for millwrights, pipefitters, electricians, instrumentation techs, and welders involved in the ABC training program. Over 20 modules of original, contextual curriculum were developed to teach the reading and math skills required for success in the craft training program.

Materials developed for instruction incorporated cognitive strategies for learning basic skills in the context of the craft and safety knowledge demanded by the industrial construction workplace. Instruction was written for a competency-based, open-entry/open-exit, individualized adult learning program that operated at the ABC training center in the evenings after work-hours.

TECHNICAL DEVELOPMENT CENTER

ABC's of Construction

National Workplace Literacy Demonstration Project



A public/private partnership of East Baton Rouge Parish Schools Adult and Continuing Education, the Greater Baton Rouge Chamber of Commerce, and the Associated Builders and Contractors (Pelican Chapter)

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READING CHARTS

ELECTRICAL AND INSTRUMENTATION MILLWRIGHTS, AND PIPEFITTING

OBJECTIVE: To use and apply information from charts.

A chart is a way to arrange information. Charts organize information into rows and columns. A row runs from left to right. A column runs from top to bottom. Headings or labels appear at the top or left of the information. This tells you what the row or column contains.

To use a chart, you first figure out what it contains.

(1) Read the title of the chart. This tells you what the chart will be contain.

(2) Look at the headings or labels. This tells you what is in the rows or columns.

Once you determine how a chart is organized, you use a chart by doing the following:

(1) Determine what question you want to answer.

(2) Look for headings or labels that show what rows or columns contain what you need.

(3) Look down a column and across a row until they meet. This should be your answer.

(4) Use your professional knowledge as an electrician, pipefitter, or millwright. Does the answer seem appropriate?

NOTE: COLORED PLASTIC STRIPS ARE INCLUDED WITH THESE MATERIALS. ONE IS LABELED "R" FOR ROW. THE ONE LABELED "C" SHOULD BE USED FOR COLUMNS. YOU USE THEM IN THE FOLLOWING WAY:

(1) FIND THE HEADING OR LABEL YOU WANT.
(2) PUT THE "R" STRIP ON THE ROW YOU WANT TO USE.
(3) PUT THE "C" STRIP ON THE COLUMN YOU WANT TO U
(4) THE PLACE WHERE THEY MEET AND CHANGE COLOR SHOULD BE YOUR ANSWER OR BE USED IN FINDING THE ANSWER.

Look how the chart below is used to answer the following questions:

CONDUIT SUPPORTS	
Conduit Size in inches	Maximum Spacing between supports in feet
1/2-1	3
1-2	5
2 1/2 and 3	6
3 1/2 to 5	7
6	8

1. What is the title of the chart? The title is found at the top of the chart. The title is CONDUIT SUPPORTS.

2. What headings or labels are used? Two labels are used. (1) CONDUIT SIZE IN INCHES
(2) MAXIMUM SPACING BETWEEN SUPPORTS IN FEET.

3. What is the maximum spacing should be used for 6 inch conduit? Find the label for maximum spacing in feet. Place the "C" strip vertically (top to bottom) there. Look under the column CONDUIT SIZE for 6. Place the "R" strip horizontally (left to right) on the 6. The spot where the "R" and "C" strips meets is your answer.

EXERCISE #1

Jess is installing conduit. He must use steel fish wire to slide past an obstruction. He uses a chart labeled DIMENSIONS OF STEEL FISH WIRE.

TRY IT!

(1) What labels are used in this chart?

_____

_____

(2) How many sizes (in width) are shown on the chart?

_____

(3) How much thickness variation is there between the thickest and thinnest wire?

_____

(4) What is the difference in width between the largest and smallest wire?

(5) What is the difference in weight per 100 ft. between the largest and smallest wire size?

APPLY IT!

1. Jess has 3/16 inch wire. What is its thickness?

---

2. Jess has some 3/8 inch wire. What is the weight per 100 ft?

---

3. Jess measured some wire. He found the thickness to be .015 inches. What is the width of the wire?

---

4. Jess must load some wire. What is the weight of 100 feet of 5/16 inch wire?

---

5. Jess is loading 1/4 inch wire. How much does 100 feet of it weigh?

6. Jess has 5/16 inch wire. What is its thickness?

7. Jess has 100 feet of wire. It weighs 11 ounces. What size wire must it be?

8. Jess has some 3/16 wire. What is its thickness?

9. Jess must load 3/16 wire. How much will 100 feet weigh

10. Jess weighed some wire. It weighed 2 lb. 8 oz. per 100 feet. How thick is the wire?

SOLVE IT!

1. Jess has 200 feet of 1/8 inch wire. How much does it weigh?

---

2. Jess wants to know the total thickness of two wires. One is 3/16 inch wire. The other is 1/4 inch wire.

---

3. Jess has 1/4 inch wire. He has 1/8 inch wire. What is the difference in their thicknesses?

---

4. Jess has 1/8 inch wire. He has 3/8 inch wire. What is the difference in their weight per 100 feet?

---

5. Jess has 500 feet of 1/4 inch wire. What is its weight?

---

6. Jess has 5/16 inch wire. He also has 3/8 inch wire. What is the difference in their thicknesses?

---

7. Jess has 100 feet of 1/8 inch wire. He also has 100 feet of 1/4 inch wire. What is the difference in their weights?

---

8. Jess has 3/16 inch wire. He also has 5/16 inch wire. What is the difference in their thicknesses?

---

9. Jess has 1000 feet of 1/4 inch wire. What is its weight?

---

10. Jess has 1/8 inch wire. He also has 3/8 inch wire. What is the difference in their thicknesses?

EXERCISE #2

Amos is installing standard conduit. He must connect pieces together. To do this, he will thread pipe. He uses a chart labeled STANDARD CONDUIT, DIMENSION OF THREADS.

TRY IT!

1. What labels are used in this chart?

_____

_____

2. How many sizes of conduit are shown on the chart?

_____

3. What is the difference in size between the largest and smallest number of threads per inch?

_____

4. What is the difference in length of threads

between the largest and smallest conduit sizes?

---

5. What would you predict to be the next inch size of conduit if the chart were continued?

APPLY IT!

1. Amos uses 1/2 inch conduit. How many threads per inch should he have?

---

2. Amos has some conduit. The length of the threads is 1.03 inches. What size pipe does he have?

---

3. Amos has 4 pieces of conduit. All have 8 threads per inch. All are different sizes. What four conduit sizes does he have?

---

4. Amos gets some 2 inch conduit. What length of threads should he have?

APPLY IT!

1. Amos uses 1/2 inch conduit. How many threads per inch should he have?

---

2. Amos has some conduit. The length of the threads is 1.03 inches. What size pipe does he have?

---

3. Amos has 4 pieces of conduit. All have 8 threads per inch. All are different sizes. What four conduit sizes does he have?

---

4. Amos gets some 2 inch conduit. What length of threads should he have?

---

5. Amos threads a pipe for .98 thread length. How many threads should he have per inch?

---

6. Amos has 2 1/2 inch conduit. What should be the length of the threads?

---

7. Amos counts the threads of some conduit. He finds 14 threads per inch. What size conduit does he have?

---

8. Amos gets 4 inch conduit. What should be the length of the threads?

---

9. Amos measures the inch length of the threads. He find it to be 1.06. How many threads should he have per inch?

10. Amos is using 3 inch conduit. How many threads should he have per inch?

SOLVE IT!

1. Amos has 1/2 inch and 1 inch conduit. What is the difference in number of threads per inch?

---

2. Amos is threading conduit. What is the difference between the number of threads per inch for 1/2 inch conduit and 3 inch conduit?

---

3. What is the difference in the length of the threads for two sizes of conduit? Amos has 2 and 3 inch conduit.

---

4. Amos has 1 1/2 inch conduit and 4 inch conduit. What is the difference in their sizes?

---

5. Amos threads two pieces of conduit. Both have 11 1/2 threads per inch. The difference between the inch length of threads is 3. What two sizes of conduit did Amos thread?

---

6. Amos threaded 1/2 and 1 inch conduit. What is the difference in the inch length of their threads?

---

7. Amos threaded 1 1/2 and 2 inch conduit. What is the difference in the number of threads per inch?

---

8. Amos threaded 1/2 inch and 3 inch conduit. What is the difference in number of threads per inch?

---

9. Amos threaded 1/2 inch and 3 inch conduit.

What is the difference in the inch length of the threads?

---

10. Amos threaded 1/2 inch and 3 1/2 inch conduit. What is the difference in the number of threads per inch?

EXERCISE #3

Leigh is installing wiring for some portable equipment She uses flexible conduit. It is covered with a liquidtight plastic sheath. Leigh refers to the chart labeled DIMENSIONS OF LIQUIDTIGHT FLEXIBLE METAL CONDUIT.

TRY IT!

1. What labels are used in this chart?

_____

_____

2. How many sizes of conduit are shown on the chart?

_____

3. How much variation is there between the thickest and thinnest inside diameters?

_____

4. How much variation is there between the thickest and thinnest outside diameters?

APPLY IT!

1. Leigh uses 1 inch conduit. What is the inside diameter?

---

2. Leigh gets some 3/8 inch conduit. What is the outside diameter?

---

3. Leigh must install some conduit in a small space. The outside diameter must be less than 1 inch. What sizes of conduit could she use?

---

4. Leigh measures some conduit. She finds the outside diameter to be 1.870 inches. What size conduit is it?

---

5. Leigh measures some conduit. She finds the inside diameter to be 1.380 inches. What should

23

be the outside diameter?

---

6. Leigh uses 3/4 inch conduit. What is the inside diameter?

---

7. Leigh gets 1 1/4 inch conduit. What is the outside diameter?

---

8. Leigh measures some conduit. She finds the inside diameter to be greater than 1 inch but less than 2 inches. What sizes of conduit could it be?

---

9. Leigh measures some conduit. She finds the outside diameter to be less than 2 inches. What could the inside diameters be?

10. Leigh installs some 2 inch conduit. What is the inside diameter?

SOLVE IT!

1. Leigh gets some 1/2 conduit and some 3 inch conduit. What is the difference in their sizes?

---

2. Leigh installed 3/4 inch conduit. What is the difference between the inside and outside diameters?

---

3. Leigh has 1 inch conduit and 3 inch conduit. What is the difference in their outside diameters?

---

4. Leigh installed 3 inch conduit. What is the difference between the inside and outside diameters?

---

5. Leigh must install some 1 1/2 inch conduit in a 2 inch space. What is the difference between the space size and the outside diameter?

---

6. Leigh has 2 inch conduit. What is the difference between the inside and outside diameters?

---

7. Leigh has 2 1/2 inch conduit. What is the difference between the conduit size and the inside diameter?

---

8. Leigh used some 2 inch conduit. What is the difference between the conduit size and the outside diameter?

---

9. Leigh has 1/2 inch conduit and 3/8 inch conduit.

What is the difference in their inside diameters?

---

10. Leigh used some conduit with an inside diameter of .820. What is the difference between the inside and the outside diameters for that conduit size?

EXERCISE #4

Casey must order rigid conduit for an installation. He uses the chart labeled RIGID CONDUIT to help him.

TRY IT!

1. **What labels are used in this chart?**

_____

_____

2. **How many sizes of conduit are shown on the chart?**

_____

3. **What three things can you determine about each size of conduit?**

_____

_____

4. What is a bundle?

_____

5. What does external diameter mean?

_____

6. Identify what the following abbreviations mean:

in. _____

lb. _____

ft. _____

APPLY IT!

1. Casey orders 1000 feet of 2 inch pipe. How much will it weigh?

---

2. Casey gets one bundle of 1 inch pipe. How many feet are in the bundle?

---

3. Casey measures the outside diameter of some conduit. It is 1.960 inches. What size conduit is it?

---

4. Casey gets a delivery of 1000 feet of conduit. It weighs 6132 pounds. What size conduit is it?

---

5. Casey orders some 1 1/4 inch conduit. How many feet will be in a bundle?

---

6. Casey orders one bundle of conduit. When it

gets in, he finds there are 100 feet in the bundle. What size conduit does he have?

7. Casey ordered 1000 feet of conduit. It weighed 7860. He must install in a space which is 3 inches in diameter. Will it fit? Explain your answer.

8. Casey ordered 3 1/2 inch conduit. How many feet will be in one bundle?

9. Casey didn't think the size of some conduit seemed right. He measured its external diameter. It was 1.960. It was supposed to be 1 1/4 inch conduit. Is that correct? Explain your answer.

10. Casey received 1000 feet of 1/2 inch conduit. What was the weight?

SOLVE IT!

1. Casey has 10 bundles of 3/4 inch conduit. How many feet of conduit does he have?

---

2. Casey has one bundle of 1/2 inch conduit. He also has a bundle of 1 1/4 inch conduit. What is the difference in the number of feet he has?

---

3. Casey ordered 500 feet of 3 inch conduit. What is its weight?

---

4. Casey has 1 inch conduit and 1 1/4 inch conduit. What is the difference in their external diameters?

---

5. Casey has 10 bundles of 1/2 inch conduit. What is its weight?

---

6. Casey order 100 bundles of 2 inch conduit. What is its weight?

---

7. Casey has 3/4 inch conduit and 1 1/4 inch conduit. What is the difference in their sizes?

---

8. Casey ordered 500 feet of 3 1/2 inch conduit. How much will it weigh?

---

9. Casey has rigging to move 5000 pounds of conduit. He is moving 2000 feet of 1 1/4 inch pipe. Will the rigging hold the load? Explain your answer.

10. **Casey ordered 12 bundles of 1 1/4 inch conduit. How many feet of conduit will he have?**

EXERCISE #5

A rawl-drive is a heat-treated steel pin with a flat head and split expanded middle. When driven in, spring action grips the side of the hole. Rawl-drives are used in masonry. They can be driven into a drilled hole. Jeff is checking the inventory. He is stocking up on parts. He uses a chart labeled DATA FOR RAWL-DRIVES to help him.

TRY IT!

1. **What labels are used in this chart?**

_____

_____

2. **How many sizes of bolts and drills are used on this chart?**

_____

3. **What four things can you determine about each size of bolt and drill?**

_____

_____

4. Identify what the following abbreviations mean:

in. _____

lb. _____

No. _____

Diam._____

APPLY IT!

1. Jeff has a 1/2 inch diameter bolt and drill. What size bolt should he use?

---

2. Jeff received a box of 100 bolts. It weighed 1 3/4 pounds. What is the inch length of the bolt?

---

3. Jeff has some bolts. They use Rawldrill number 16. What is the inch diameter of the bolt and drill?

---

4. Jeff wants to order 3 inch length bolts. How many will be packed in each box?

---

5. Jeff wants to use a 3/8 inch bolt and drill. How much will 100 bolts for that size weigh?

6. Jeff ordered bolts for a number 20 Rawldrill. How much will 100 bolts weigh?

7. Jeff received an order of 100 bolts. They weighed 6 pounds. What is the inch length of the bolts?

8. Jeff received a box of bolts. There were 50 bolts in the box. What size bolts were they?

9. Jeff will be using a bolt and drill with a diameter of 1/4 inch. What size Rawldrill will he use?

10. Jeff received an order of 100 bolts. It weighed 25 pounds. How many bolts were in each box?

SOLVE IT!

1. Jeff ordered 25 pounds of 1/2 inch bolts. How many boxes of bolts did he receive?

---

2. Jeff ordered 2 sizes of bolts. Some were 3/8 inch in diameter. Others were 1/2 inch in diameter. What is the difference in their lengths?

---

3. Jeff ordered 2 boxes of 3/16 inch bolts. How much will they weigh?

---

4. Jeff ordered 4 boxes of bolts to go with a #20 Rawldrill. How much will his order weigh?

---

5. Jeff received 10 boxes of 1/4 inch bolts. How

much will they weigh?

---

6. Jeff has 2 sizes of bolts. Some are 3/16 diameter. Others are 5/16 diameter. What is the difference in their diameters?

---

7. Jeff has 2 sizes of bolts. Some are 1/2 diameter. Others are 1/4 diameter. What is the difference in their diameters?

---

8. Jeff ordered 6 boxes of bolts. Each bolt was 1 1/2 inch long. How much did the bolts weigh?

---

9. Jeff ordered 2 sizes of bolts. Some were 5/16 inch diameter. Others were 1/2 inch diameter. What is the difference in their lengths?

10. Jeff received 9 pounds of 1/4 inch bolts. How many boxes of bolts did he have?

EXERCISE #6

Mike's job calls for rigid aluminum conduit. Mike knows this conduit is lightweight. It is a good conductor. It will be easy to thread. He refers to a chart on ALUMINUM RIGID CONDUIT COUPLINGS to make connections.

TRY IT!

1. **What labels are used in this chart?**

_____

_____

2. **How many trade sizes of couplings are shown on the cha**

_____

3. **What three things can you determine about each size of conduit coupling?**

APPLY IT!

1. The first conduit run calls for 5 inch conduit. What will be the outside diameter of the coupling?

---

2. Mike gets 1 inch conduit. What will be the length of the coupling?

---

3. Mike gets an order of 100 pieces of 2 inch coupling. How much should it weigh?

---

4. Mike gets an order of 100 pieces of coupling. It weighs 321 pounds. What length will each piece be?

---

5. Mike measures some coupling. The outside diameter is 3 15/16 inches. What is the length of the coupling?

---

6. Mike gets an order of 100 couplings. It weights 91.4 pounds. What is the outside diameter of each piece?

---

7. Mike gets some 5 inch conduit. What is the length of each piece?

---

8. Mike measures some couplings. It's outside diameter is 7 5/16. What is its trade size?

---

9. Mike gets 100 pieces of coupling. It weighs 241.9 pounds. What is the outside diameter of each piece?

10. **Mike gets an order of 4 inch couplings. What is their length?**

SOLVE IT!

1. Mike has 2 trade sizes of coupling. Some are 3 inch. Some are 6 inch. What is the difference in their outside diameters?

---

2. Mike has 2 trade sizes of coupling. Some are 3 inch. Some are 6 inch. What is the difference in their lengths?

---

3. Mike ordered 100 pieces of 1 inch coupling. He also got 100 pieces of 2 inch coupling. What is their combined weight?

---

4. Mike ordered 500 pieces of 6 inch coupling. What is their total weight?

---

5. Mike ordered 100 pieces of 4 inch coupling. He also ordered 100 pieces of 5 inch coupling. What is the difference in their weights?

---

6. Mike ordered 1 inch coupling. He also ordered 6 inch coupling. What is the difference in their lengths?

---

7. Mike has 50 pieces of 4 inch coupling. How much does it weigh?

---

8. Mike has 4 inch and 5 inch coupling. What is the difference in their outside diameters?

---

9. Mike has 1 inch and 2 inch couplings. What is

the difference in their lengths?

---

10. Mike has 10 pieces of 6 inch conduit. How much does it weigh?

EXERCISE #7

Joe must order supplies. He needs to order casing nails. He needs to order different sizes. He uses the chart labeled CASING NAIL SIZES.

TRY IT!

1. **What labels are used in this chart?**

_____

_____

2. **How many sizes of casing nails are used on this chart?**

_____

3. **What three things can you determine about each nail size?**

_____

_____

53

4. Identify what the following mean:

in. _____

lb. _____

_____

Gage _____

Per _____

APPLY IT!

1. Joe needs nails that are 14 gage. Which sizes could he order?

---

2. Joe needs 1000 1 inch nails. Approximately how much will they weigh?

---

3. Joe orders 2 inch nails. How many nails will be in one pound?

---

4. Joe receives an order of 3 1/2d nails. How many should be in one pound?

---

5. The job calls for 7d nails. What is their gage?

6. The job also calls for 1 3/4 inch nails. What size should Joe order?

7. Joe receives an order. He counts the nails. There are 210. What size nails are they?

8. Joe has a 15 1/2 gage nail. How many nails equal one pound?

9. Joe orders 6d nails. How many nails will be in one pound of nails?

10. Joe orders 2 inch nails. What will be their gage?

SOLVE IT!

1. Joe orders 2d and 4d nails. What is the difference in their lengths?

---

2. Joe orders 5 pounds of 9d nails. How many nails should he get?

---

3. Joe has one pound of 8d nails. He also has one pound of 7d nails. How many nails does he have?

---

4. Joe has 5d and 9d nails. What is the difference in their lengths?

---

5. Joe has 105 7d nails. Approximately how much

does it weigh?

---

6. Joe has 10 pounds of 4d nails. How many nails does he have?

---

7. Joe gets 3 1/2d nails. The job calls for nails with are 1 3/4 inch long. How much difference is there?

---

8. Joe gets 7 pounds of size 5d nails. How many nails are there?

---

9. Joe orders 8d nails. He meant to order 3d nails. What is the difference in their lengths?

---

10. Joe ordered 4d nails. He received 6d nails. What is the difference in their gage?

EXERCISE #8

Lee is installing electrical metallic tubing. She refers to a chart labeled ELECTRICAL METALLIC TUBING.

TRY IT!

1. **What labels are used in this chart?**

_____

_____

2. **How many sizes of electrical metallic tubing are shown on the chart?**

_____

3. **What four things can you determine about each size of electrical metallic tubing?**

_____

_____

4. What is measured in ft., lb?

_____

5. What two columns concern diameter?

_____

APPLY IT!

1. How much does tubing weigh? Lee ordered 1000 feet of 2 inch tubing.

---

2. Which size of tubing can Lee use? He needs tubing with an inside diameter of at least 4 inches.

---

3. Lee measures the wall thickness of some tubing. The thickness is 0.065. What sizes might it be?

---

4. Lee needs to use tubing with less than 1 inch outside diameter. What sizes could he use?

---

5. Lee measures the outside diameter of some tubing. It is 3.500. What is the inside diameter?

6. Lee receives an order of tubing. He gets 1000 feet of it. It weights 2300 pounds. What size is it?

7. Lee compares the outside diameters of 3 and 4 inch tubing. What is the difference?

8. Lee got 2700 pounds of tubing. What is its wall thickness?

9. What is the wall thickness of some tubing? Lee has tubing with an inside diameter of 0.824.

10. Lee must use tubing with a wall thickness of 0.057. What size should she order?

SOLVE IT!

1. What is the difference between inside and outside diameters? Lee has 1 1/2 pipe.

---

2. The warehouse delivered the wrong size of tubing. It brought tubing with a wall thickness of 0.072. Lee ordered the next largest thickness. What is the difference in the thicknesses?

---

3. Lee rigged a load for 1000 pounds of tubing. She got 2000 feet of 1 1/4 inch tubing. What is the difference between the rigging and the tubing weight?

---

4. Lee has a space which is 2.33 inches in diameter. What is the clearance if she uses 2 inch tubing?

---

5. Lee has 3/4 inch tubing. How much smaller is the inside diameter than its outside diameter?

---

6. Lee installed two sizes of tubing. She used 1/2 inch adjacent to 1 inch tubing. What is its total height?

---

7. Lee ordered 6000 feet of 1/2 inch tubing. What is its total weight?

---

8. Lee is using 2 1/2 inch conduit. What is the difference in the inside and outside diameters?

---

9. Lee used 1 1/4 and 1 1/2 inch tubing. What is the difference in their wall thicknesses?

10. What is the total weight of a load? Lee has 1000 feet of 2 inch tubing. She also got 1000 feet of 1 inch tubing.

EXERCISE #9

Chuck is installing open wiring. Some wires will cross others. He plans to use flexible tubing. He uses the chart PROPERTIES OF FLEXIBLE TUBING OR LOOM.

TRY IT!

1. **What labels are used in this chart?**

_____

_____

2. **How many sizes (in inside diameter) are shown on the chart?**

_____

3. **What does inside diameter mean?**

_____

4. **What does outside diameter mean?**

5. What does odd lengths mean?

6. Each inside diameter size increases by the same fraction. What is that fraction?

7. If the chart had one more size of tubing at the bottom, what size might that be?

APPLY IT!

1. Chuck must choose tubing. Space is limited. What is the smallest size available?

---

2. Chuck is using 1 inch loom. What is the outside diameter?

---

3. Chuck measured a full coil. It had 100 feet of tubing. What sizes could it be?

---

4. Chuck must run 1000 feet of 2 inch tubing. How much would that 1000 feet weigh?

---

5. Chuck measured the outside diameter of some tubing. It was 1 41/64 inches. What is the inside

diameter?

---

6. Chuck received an order of tubing. He has 1000 feet of tubing. It weighed about 400 pounds. What is the inside diameter?

---

7. Chuck must fish tubing behind some brick. The space is less that one inch. What outside diameters of tubing can he use?

---

8. Chuck must order some 1 3/4 inch tubing. How much will be on one coil?

---

9. One job requires an inside diameter of 1 1/2 inches. What will be the outside diameter?

10. Tubing will be installed between woodwork. It must have an outside diameter of less than 2 inches. The inside diameter must be at least one inch. What sizes could Chuck use?

SOLVE IT!

1. Chuck ordered a coil of 1/4 inch tubing. He was send 1/2 inch tubing. What is the difference in the amount on the coils?

---

2. Chuck needs 1000 feet of 1/2 tubing. How many coils should he order?

---

3. What is the difference between the inside and outside diameters? Chuck has 2 1/4 inch loom.

---

4. Chuck has 5 coils of 1 inch tubing. How much does it weigh?

---

5. Chuck has 1000 feet of 2 inch tubing. How many coils does he have?

6. Chuck has a full coil of 1/4 inch loom. He has a full coil of 1 1/4 inch tubing. What is the difference in their lengths?

7. Chuck moves tubing with a dolly. It carries 500 pounds at a time. How many coils of 1 inch tubing can he move at a time?

8. Chuck must fish wire in a 1 1/2 inch space. He is using loom with 1 5/16 outside diameter. How much clearance will he have?

9. Chuck has 100 feet of 1 1/4 inch loom, 500 feet of 2 inch loom, and 1000 feet of 2 1/4 inch tubing. What is the total weight?

10. Chuck has 5 coils of 1/4 inch loom, 3 coils of 1/2 inch loom, and 9 coils of 1 1/4 inch loom. What is the total length of the tubing?

EXERCISE #10

Jake must order general construction materials. He refers to the chart ANCHOR SELECTION CHART BY TYPE OF MATERIAL.

TRY IT!

1. **What labels are used horizontally (left to right) on this chart?**

_____

_____

2. **What labels are used vertically (top to bottom) on this chart?**

_____

_____

3. **What does a dot inside the box mean?**

APPLY IT!

1. Jake needs anchors for brick. How many choices does he have?

---

2. Jake must order something with has many uses. Which anchor can be used in the most materials?

---

3. Which anchor can be used in the least number of materials?

---

4. Jake must install anchors in stucco and glass. What anchors can be used?

---

5. Jake is installing a slate floor. What kind of anchors can he use?

6. What materials call for the use of a calk-in?

7. Jake must install concrete, stone, and terra cotta. What anchor could be used for each?

8. Jake ordered some lag shields for brick installation. What else can he use them for?

9. What is the difference in usage for a spring-wing and a rawly?

10. Chuck is installing cinder blocks. What can he use for anchors?

SOLVE IT!

No problems available.

PIPEFITTING

EXERCISE #1

Dave works with a road crew. They work with concrete. They install culvert, storm drain, and sewer pipe. Dave uses the chart REINFORCED CONCRETE CULVERT, STORM DRAIN, & SEWER PIPE. This helps him decide which sizes he needs.

TRY IT!

1. What labels are used in this chart?

_____

_____

2. How many sizes of culvert, drain, or sewer pipe are shown on the chart?

_____

3. What is measured in pounds per foot?

_____

4. What two columns show measurements in inches?

_____

5. What do the abbreviations in., lb, avg.,and ft mean?

_____

_____

APPLY IT!

1. Dave uses 12 inch culvert. What is its weight in pounds per foot?

---

2. Dave must replace some storm drains. He measures the wall thickness. It was 2 inches thick. What is the inside diameter of a pipe?

---

3. Dave is using 30 inch sewer pipe. How thick are the walls?

---

4. Dave received a load of concrete culvert. It weighed 310 pounds per foot. What wall thickness did it have?

---

5. Dave measured the inside diameter of some drain pipe. It was 15 inches. What should the wall thickness be?

---

6. The wall thickness of some storm drain is 2 1/4 inches. What is the inside diameter?

---

7. Dave rigged a load to hold 300 or more pounds per foot. What sizes of pipe can he move?

---

8. Dave must replace a storm drain. It must weigh less than 150 pounds per foot. What sizes can Dave use?

---

9. Dave measured the wall thickness of a sewer pipe. It was more than 2 inches. What sizes of

pipe might it be?

---

10. Dave used the largest size of sewer pipe. What is the wall thickness?

SOLVE IT!

1. Dave ordered 10 feet of 21 inch culvert. How much will it weigh?

---

2. Dave has 10 feet of 12 inch sewer pipe. He also has 5 feet of 15 inch sewer pipe. What is its total weight?

---

3. Dave estimates the flow in a drain to average half the diameter of the pipe in inches. The inside diameter is 24 inches. How deep should the flow be?

---

4. What is the difference in the inside diameters of 18 inch and 27 inch pipe?

---

5. What is the difference in the wall thicknesses for 12 inch and 15 inch pipe?

---

6. Dave has 16 feet of 18 inch pipe. He also has 29 feet of 27 inch pipe. He has 46 feet of 21 inch pipe. What is the total length of the pipe?

---

7. Dave has 10 feet of 24 inch culvert. He has 10 feet of 15 inch culvert. What is the total weight of the culvert?

---

8. What is the difference in the inside diameters? Dave has 12 inch and 30 inch pipe.

---

9. What is the difference in wall thicknesses? Dave has 21 and 27 inch pipe.

10. Dave rigged a load to hold 1000 pounds safely. He is moving 20 feet of 12 inch pipe. Will that be a safe load? Explain your answer.

EXERCISE #2

Craig is installing pipe in trenches. Such underground construction requires different materials. Craig is using ductile iron pipe. He is unfamiliar with its sizes and wall thicknesses. He uses the chart DUCTILE IRON PIPE to help him.

TRY IT!

1. **What labels are used in this chart?**

_____

_____

2. **How many sizes of pipe are shown on the chart?**

_____

3. **What do the class sizes indicate?**

_____

4. How many classes of pipe are shown on the chart?

_____

APPLY IT!

1. Craig wants size 3, class 53. What is the wall thickness?

---

2. Craig measures some old pipe. He knows it is a size 18. The wall thickness is .38. What class size is it?

---

3. Craig needs a size 12 pipe. It must have a thickness of .35 or more. What classes sizes could Craig use?

---

4. Several pipes must be replaced. Craig measures the wall thickness. It is .25. What is the smallest size pipe it could be?

---

5. Which pipe has the greatest wall thickness? Craig can use size 8, class 50 pipe. He could also use size 6, class 51.

---

6. Did Craig get what he ordered? Craig wanted Size 14, Class 54 pipe. He checked the wall thickness. It is .42 inches. What did he get?

---

7. Craig needs an odd size pipe. What size could he order?

---

8. Craig needs a pipe with a wall thickness of more than .45 inches. What sizes and classes can he use?

---

9. Craig ordered a size 10 pipe. The class size is

52. What is it's wall thickness?

---

10. Craig has a size 4 pipe. The thickness of the wall is .29. What is the class size?

SOLVE IT!

1. What is the difference in class size? Craig has size 10 pipe. He can use class 50 or class 54.

---

2. What is the difference in wall thickness? Craig is using Class 51 pipe. He has one size 3. The other is size 16.

---

3. Craig notices something interesting. For any size pipe, the wall thicknesses increase by the same number as the classes increase. What is that number?

---

4. Craig has size 18 pipe. He has size 20 pipe. Both are class 53. What is the difference in wall thickness?

5. Craig can use size 14, class 50 pipe. He could use size 8, Class 52. What is the difference in their thicknesses?

6. Craig looks at the chart. He finds the pipe with the very thinnest walls. He finds the pipe with the very thickest walls. What is the difference in their thicknesses?

7. Craig has size 3 pipe. He has size 4 pipe. Both are class 54. What is the difference in their wall thicknesses?

8. Craig has size 6 pipe. He has size 16 pipe. Both are Class 50. What is the difference in their wall thicknesses?

9. Craig looks at the chart. He notices something interesting. The last 4 sizes of pipe have something in common. He looks down each class column beginning with size 14. The class sizes all increase by the same number. What is that number?

10. Craig has class 54 pipe. He has size 20. He has size 10. What is the difference in their wall thicknesses?

EXERCISE #3

Kurt's boss wants to improve the crew's safety record. Most accidents occur in rigging loads. Each person gets a copy of MAXIMUM SAFE WORKING LOADS to review.

TRY IT!

1. **What labels are used in this chart?**

_____

_____

2. **How many web widths are shown on the chart?**

_____

3. **How many kinds of hitches are shown on the chart?**

_____

APPLY IT!

1. Kurt is using 2 inch web. How much can he lift with a single vertical hitch?

---

2. Kurt is using 9 inch web. What kind of hitch allows him to lift the largest load?

---

3. Kurt needs to rig a load with 10 inch web. How much can he lift with a single choker hitch?

---

4. Kurt's boss checks a load. The load weighs 5000 pounds. The crew used a single choker hitch. They used 2 inch web. What will the boss say and why?

---

5. Kurt is using 9 inch web. He makes a single

basket hitch. How much will the load hold?

---

6. Kurt has 6 inch web. He makes a single vertical hitch. How much will it hold?

---

7. Curt only has 1 inch web. What is the most weight he can lift? What hitch should he make to do so?

---

8. Curt checked the chart. He used 7 inch web. He needed to move 25000 pounds. He made a single choker hitch. The rigging was too weak. What went wrong?

---

9. Curt has 2 inch web. He needs to move 3200 pounds. What kind of hitch should he make?

10. The crew uses 5 inch web. They made a single vertical hitch. How much can they load?

SOLVE IT!

1. Kurt uses 2 inch web. How much more will a basket hitch hold than a choker hitch?

---

2. What is the difference in rigging loads with a vertical hitch? Kurt has 4 inch and 7 inch web.

---

3. Curt wants to move 10000 pounds. He has 6 inch web. He makes a single vertical hitch. What is the difference between the safe working load rating and the amount to be moved?

---

4. Curt has 9 inch web. What is the difference between loads for a choker hitch and a vertical hitch?

---

5. Curt rigs two loads. One uses 3 inch web, single

basket hitch. One uses 6 inch web, single vertical hitch. What is the difference in their safe working loads in pounds?

---

6. Curt rigs 8 inch web with a choker hitch. He rigs 10 inch web with a vertical hitch. What is the total weight he can safely move?

---

7. Curt has 3 inch web. What is the difference in load weights for a vertical hitch and a basket hitch?

---

8. Curt looks down the column for loads for a single choker hitch. He finds that the loads increase with each web inch by the same amount. What is that amount?

---

9. Curt has 4, 5, and 6 inch web. He rigs one load with each kind of web. He always uses a single basket hitch. What is the maximum weight he can load?

---

10. Curt has 6 and 10 inch web. He rigs a load with each. He uses a choker hitch. What is the total weight he can load?

EXERCISE #4

Luke's crew is doing roadwork. Luke works with concrete. His job is to order and inspect shipments. He refers to a chart labeled REINFORCED CONCRETE ELLIPTICAL CULVERT, STORM DRAIN, AND SEWER PIPE.

TRY IT!

1. **What labels are used in this chart?**

_____

_____

2. **How many sizes are shown on the chart?**

_____

3. **What is an axis?**

_____

4. What is the difference between a major axis and a minor axis?

---

5. What does elliptical mean?

---

6. What does it mean to weigh something in lb/ft?

APPLY IT!

1. Luke must use 54 inch equivalent round pipe. What will the minor axis be?

---

2. Plans call for 24 inch pipe. What will the wall thickness be?

---

3. The crew gets a load of 66 inch pipe. What is the weight in pounds per foot?

---

4. What is the wall thickness of a pipe? Luke is using 48 inch pipe.

---

5. Luke measures the major axis of some old pipe. It is 38 inches. What will the minor axis be?

6. Luke checks the major axis of a storm drain. It is 76 inches. What should the pipe's wall thickness be?

7. Some pipe must be rigged for moving. It is 18 inch pipe. How much will each foot of pipe weigh?

8. Luke finds the minor axis of a sewer pipe to be 29. How much will each foot of it weigh?

9. Luke ordered some 30 inch pipe. What is its minor axis?

10. The major axis of a pipe is 91 inches. How thick are the walls?

SOLVE IT!

1. Luke orders 29 feet of 66 inch sewer drain. How much will it weigh?

---

2. Luke compares the wall thicknesses of 18 and 24 inch pipe. What is the difference?

---

3. Luke has 72 inch pipe. What is the difference between the sizes of the minor and major axis?

---

4. Luke gets 58 feet of 48 inch pipe. How much does it weigh?

---

5. Luke measures 66 inch pipe and 54 inch pipe. What is the difference in wall thicknesses?

6. Luke looks at the chart. He looks down the column labeled "equivalent round size, inches." He finds that each size increases by the same amount. What is that amount?

7. What is the difference between major and minor axis. Luke has 30 inch pipe.

8. Luke orders 10 feet of 24 inch pipe. He receives 18 feet instead. what is the difference in the weight of the pipes?

9. Luke compares wall thicknesses. He has 24 inch pipe. He has 36 inch pipe. What is the difference?

10. Luke needs 18 feet of 72 inch drain. He needs 16 feet of 66 inch drain. He needs 85 feet of 18 inch culvert. What is the total weight of the pipes he needs?

EXERCISE #5

Jo's construction company is working at a chemical plant. She will be welding stainless steel pipe. She reviews the chart GRADES OF STAINLESS STEEL.

TRY IT!

1. **What labels are used in this chart?**

_____

_____

2. **How many pipe sizes are shown on the chart?**

_____

3. **How many schedules are shown on the chart?**

_____

4. **What does a schedule tell about a pipe size?**

_____

APPLY IT!

1. Jo needs the largest size of pipe. What size would that be?

---

2. Jo orders 6 inch, Schedule 10S pipe. How thick should the pipe wall be?

---

3. Jo gets her 6 inch pipe. The wall thickness is 0.432. What schedule pipe is it?

---

4. Jo needs a pipe that is 0.120 thick. What size and schedule of pipe can she get?

---

5. What schedule should Jo order? Plans call for

10 inch pipe. The walls should be .500 inch thick.

---

6. Jo gets a pipe. She measures the wall thickness. It is 0.258. She knows it is schedule 40S. What size is the pipe.

---

7. Jo needs some 10 inch pipe. The thickness of the walls must be less than 0.300. What schedule pipe should she get?

---

8. The crew must replace a pipe. They measure the pipe's diameter. It is 3 inches. They measure the wall thickness. It is 0.300. What schedule pipe should be ordered?

---

9. Jo orders 8 inch, Schedule 10S pipe. She

measures the wall thickness. It is 0.148. What Schedule pipe did she receive?

---

10. Jo finds that 3 schedule 80S pipes have the same wall thickness. What is that wall thickness?

SOLVE IT!

1. Jo has 1 inch pipe in two sizes. She has Schedule 10S and Schedule 80S. What is the difference in the pipe walls.

---

2. Plans require 10 inch pipe. Jo needs a wall thickness of 1/2 inch. What should she order?

---

3. Jo has 3 and 4 inch pipe. Both are Schedule 10S. What is the difference in their wall thicknesses?

---

4. Jo has 5 inch, Schedule 80S pipe. She has 12 inch, Schedule 40S pipe. What is the difference in the sizes of the pipe?

SOLVE IT!

1. Jo has 1 inch pipe in two sizes. She has Schedule 10S and Schedule 80S. What is the difference in the pipe walls.

---

2. Plans require 10 inch pipe. Jo needs a wall thickness of 1/2 inch. What should she order?

---

3. Jo has 3 and 4 inch pipe. Both are Schedule 10S. What is the difference in their wall thicknesses?

---

4. Jo has 5 inch, Schedule 80S pipe. She has 12 inch, Schedule 40S pipe. What is the difference in the sizes of the pipe?

---

8. Jo replaced some pipe. She used 2 inch, schedule 10S pipe. There was a difference of .045 between the old and new pipe. What schedule was the old pipe?

---

9. Jo has 6 inch, Schedule 10S pipe. She has 1 inch, Schedule 80S pipe. What is the difference in the wall thicknesses of the pipe?

---

10. Jo installed schedule 80S pipe. She used 8 inch and 2 inch pipe. What is the difference in wall thicknesses?

---

8. Jo replaced some pipe. She used 2 inch, schedule 10S pipe. There was a difference of .045 between the old and new pipe. What schedule was the old pipe?

---

9. Jo has 6 inch, Schedule 10S pipe. She has 1 inch, Schedule 80S pipe. What is the difference in the wall thicknesses of the pipe?

---

10. Jo installed schedule 80S pipe. She used 8 inch and 2 inch pipe. What is the difference in wall thicknesses?

MILLWRIGHT

EXERCISE #1
Bill often rigs loads for standard steel. He will be loading extra strong steel. He uses the chart STEEL PIPE WEIGHTS-EXTRA STRONG to help him adjust his rigging.

TRY IT!

1. What labels are used in this chart?

_____

_____

2. How many nominal sizes of pipe are shown on the chart?

_____

3. What is a nominal size?

4. What does weight by lb. per ft. mean?

APPLY IT!

1. Nick has 1/2 inch pipe. How much does each foot weigh?

_____

2. Nick knows some pipe weight 3 pounds per foot. What size pipe is it?

_____

3. Nick orders 3/4 inch pipe. What is its weight in pounds per foot?

_____

4. Nick receives 2 inch pipe. What is its weight in pounds per foot?

_____

5. Nick gets the smallest size of pipe. How much would one foot of it weigh?

6. Plans call for 1 inch pipe. How much will it weigh in pounds per foot?

7. Nick installs the largest size of steel pipe. How much will it weigh by the foot?

8. Nick receives some pipe. It weights 3.63 per foot. What size pipe is it?

9. Nick needs some lightweight pipe. It must weigh less than a pound per foot. What size should he order?

10. Nick weighs some pipe. It weighs more than 2

pounds but less than 3 pounds. What size pipe is it?

SOLVE IT!

1. Nick has 1/2 and 1 1/4 inch pipe. What is the difference in their nominal sizes?

---

2. Nick has 2 inch and 2 1/2 inch pipe. What is the difference in their weights in pounds per foot?

---

3. Nick orders 20 feet of 1/4 inch pipe. How much will it weigh?

---

4. Nick receives 100 feet of pipe. It weighs 300 pounds. What size pipe did he get?

5. Plans call for 150 feet of 1/4 inch pipe. They also require 80 feet of 1/2 inch pipe. What is the total weight of the pipe?

6. Nick orders 3/4 inch pipe. He receives 2 1/2 inch pipe. What is the difference in their nominal sizes?

7. Nick receives 200 feet of 1/2 inch pipe. How much does it weigh?

8. Nick gets 100 feet of 3/4 inch pipe. He used half of it. What is the weight of the remaining pipe?

9. The company ordered 1000 feet of 2 inch pipe. The weight of the shipment was 7660 pounds. What size pipe was delivered?

---

10. Nick has 10 feet of 1 inch pipe. He has 20 feet of 2 inch pipe. He has 50 feet of 1 1/4 inch pipe. What is the total weight of the pipe?

EXERCISE #2

Nick sometimes gets in a hurry. He estimates lathe feed rates. His cuts are not always right. His boss gives a chart on LATHE FEED RATES.

TRY IT!

1. **What labels are used in this chart?**

_____

_____

2. **How many materials shown on the chart?**

_____

3. **What is a rough cut?**

_____

4. **What is a finish cut?**

_____

APPLY IT!

1. Nick is working with aluminium. How deep should he make a rough cut?

---

2. Nick made a rough cut on cast iron. How deep should the cut be?

---

3. Plans call for a finish cut on steel alloy. How deep should Nick make the cut?

---

4. Nick looks at the chart. All of the materials except one have the same finish cut. Which one does NOT have the same finish cut?

---

5. Two materials have the same rough cut depth. Which two are those?

---

6. Nick gets a piece of cast iron. How deep should he make a finish cut?

---

7. Nick made a rough cut of 0.020 on steel alloy. Did he cut it correctly? If not, what should the cut be?

---

8. Nick must cut a brass pipe. How deep should he make a rough cut?

---

9. Nick makes a finish cut on brass. It was at a depth of 0.010. What might his supervisor tell him?

10. Plans call for the use of aluminum. How deep should Nick make the finish cut?

SOLVE IT!

1. Nick is working with steel alloy pipe. What is the difference between the least rough cut and the least finish cut?

---

2. The wall thickness of a pipe is 1 inch. What is the range of the finish cut Nick can make in bronze?

---

3. Nick is cutting brass pipe. What is the difference between the deepest rough cut and the deepest finish cut?

---

4. Nick measures a finish cut he made in cast iron. It is 0.010. What is the difference between that cut and the deepest cut it could be?

---

5. Plans call for use of bronze pipe. The wall thickness is 0.500 inches. What is the range of pipe with will be left following a rough cut?

---

6. Nick made a rough cut on brass. His cut was 0.005 inches. How much deeper should it be to be in the range for that material?

---

7. Nick compares rough cut rates for aluminum and steel allow. What is the difference in their ranges?

---

8. Nick compares rough and finish cuts for cast iron. What is the difference in their ranges?

---

9. Nick compares rough and finish cuts for brass. What is the difference in their ranges?

---

10. Nick wants to know the range for a rough cut for cast iron. What is the difference between the amounts in that range?

EXERCISE #3

Kate's has a new job. She will be using a lathe. She uses the LATHE CUTTING SPEEDS chart to familiarize herself.

TRY IT!

1. **What labels are used in this chart?**

_____

_____

2. **How many materials shown on the chart?**

_____

3. **What is a rough cut?**

_____

4. **What is a finish cut?**

_____

5. What does ft. per min. mean?

_____

APPLY IT!

1. Kate works with aluminum. What is the cutting speed for a rough cut?

---

2. Kate fed brass pipe at 250 feet per minute for a rough cut. Was that correct? Why or why not?

---

3. Kate wants to know what material must be fed most slowly. Which material would that be?

---

4. Kate looks to see what material can be fed most quickly. Which one is that?

---

5. Kate must do rough cuts with bronze. She must do finish cuts with steel alloy. What is unusual

about those two cutting speeds?

---

6. Kate is making rough cuts on steel alloy. What should they be?

---

7. Kate must cut cast iron. She must make finish cuts. What should the lathe cutting speed be?

---

8. Kate cut brass and bronze. Which one can she cut more quickly?

---

9. Kate made a finishing cut on aluminum. What should have been her maximum speed in feet per minute?

---

10. Kate used steel alloy. What is the fastest rate at which she should make a finish cut?

SOLVE IT!

1. Kate wants to know the range for rough cuts in aluminum. What is the difference between the slowest and fastest rates in feet per minute?

---

2. Kate compares cutting speeds for making finish cuts on steel alloy and brass. What is the difference in the ranges?

---

3. Kate compares cutting speeds for finish and rough cuts for brass. What is the difference?

---

4. Kate has 100 feet of aluminum to cut. She wants to make a rough cut. How long should it take if she goes at the slowest speed?

---

5. Kate is working with bronze. She needs to make finishing cuts. She has 500 feet to cut. How long will it take if she goes at the slowest speed?

---

6. Kate must cut brass. She has 600 feet. She wants to make finish cuts at the fastest possible rate. How long with that take?

---

7. Kate is cutting cast iron. She cut 140 feet in two minutes. Was she making a rough cut or a finish cut?

---

8. Kate compares the range for finish cuts for cast iron and aluminum. What is the difference?

---

9. Kate cut a material correctly. It only took her 2 minutes to cut 1000 feet. What was the material?

---

10. Kate has 100 feet of steel alloy to cut. She wants to make a rough cut. How long should it take in feet per minute if she goes at the slowest speed?

EXERCISE #4

Pete's crew usually works with steel. Their new job calls for copper tubing. Each crew member reviews the COPPER TUBING-WEIGHT chart before rigging loads.

TRY IT!

1. What labels are used in this chart?

_____

_____

2. How many sizes of pipe are shown on the chart?

_____

3. How many types of pipe are shown on the chart?

_____

4. What does lb. per ft. mean?

_____

APPLY IT!

1. Pete received 1 inch tubing. It is Type K tubing. How much does it weigh in pounds per foot?

---

2. Pete needs 3 1/2 inch tubing. What type tubing is heaviest?

---

3. Pete must use lightweight materials. He needs 3 inch tubing. Which type should he use?

---

4. Pete received some tubing. It was Type M tubing. It weighed 2.030 pounds per foot. What is the nominal size?

---

5. Pete ordered 1/2 tubing. He asked for Type K.

The tubing came it. It weighed 0.839 pounds per foot. What size tubing did Pete get?

---

6. Pete is using 1 inch tubing. He needs a type that weighs less than half a pound per foot. What type does he need?

---

7. Pete must order 1 1/2 inch tubing. It must be strong. It must weigh more than 1 1/2 pounds per foot. What type should he order?

---

8. Pete needs the smallest and lightest size for a job. Which size and type should he use?

---

9. Plans call for very heavy duty pipe. What size and type of pipe should Pete choose?

10. Pete orders Type M pipe. He ordered 4 inch pipe. How much will it weigh in pounds per foot?

SOLVE IT!

1. Pete used 1 inch pipe. He ordered 100 feet, Type M. What is its weight?

---

2. Pete ordered 2 inch pipe. He ordered 25 feet of each type. What was the total weight?

---

3. Pete received 10 feet of Type L tubing. It weighed 40 pounds. What size was it?

---

4. Pete has 60 feet of Type K tubing. He has 80 feet of Type M tubing. Both are 4 inch. What is the difference in weight?

---

5. Pete has ten feet of each size of type K tubing.

What is the total weight of the tubing.

---

6. Pete has 90 feet of Type M tubing. Half of it is 2 inch tubing. Half is 3 inch tubing. What is the difference in their weights.

---

7. Pete has 80 feet of Type K tubing. One-fourth of it is 2 inch tubing. Half is 3 1/2inch tubing. The rest is 1 inch tubing. What is total weight?

---

8. Pete is loading tubing. He rigs a load for 600 pounds. He has 550 feet of 3 inch tubing. All is Type K. How much is it over the limit?

---

9. Pete has 188 feet of 1/2 inch tubing. It is type K. What is its weight?

10. Pete received 105 feet of 1 1/2 inch tubing. It is Type L tubing. What does it weigh?

EXERCISE #5

Bo is a new construction worker. He is not familiar with rigging pipe. His supervisor gives a chart on STEEL PIPE WEIGHTS-STANDARD.

TRY IT!

1. **What labels are used in this chart?**

_____

_____

2. **How many sizes of pipe are shown on the chart?**

_____

3. **What does lb. per ft. mean?**

_____

4. **What is a nominal size?**

_____

APPLY IT!

1. **Bo has 3/4 inch pipe. How much does in weigh in pounds per foot?**

---

2. **Bo has some pipe. It weights 2.72 pounds per foot. What size is it?**

---

3. **Bo has 1 1/4 inch pipe. How many pounds does one foot of it weigh?**

---

4. **Bo needs a large size pipe. What size should he choose**

---

5. **Bo needs lightweight pipe. It must weigh less than one pound per foot. What should he order?**

6. Bo needs a pipe that weighs more than 3 pounds but less than 4 pounds. What should he choose?

7. Bo orders pipe. It is 1 inch pipe. How must does one foot of it weigh?

8. Bo gets a load of pipe. It weights 2.27 pounds per foot. What size pipe is it?

9. Bo orders 1/2 inch pipe. The pipe he receives weighs 1.68 pounds per foot. What size did Bo receive?

10. Bo has 5 inch pipe. How much does a pound of it weigh

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SOLVE IT!

1. Bo measures 2 pipes. He has 1/2 inch and 3/4 inch pipe. What is the difference in their diameters?

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2. Bo receives 10 feet of 2 1/2 inch pipe. What is the weight?

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3. Bo compares 1 1/4 and 2 1/2 inch pipe. What is the difference in the weights in pounds per feet?

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4. Bo receives 25 feet of 1 inch pipe. He has 40 feet of 2 inch pipe. What is the difference in their weights?

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5. Bo receives 38 feet of 1 1/4 inch pipe. He has 10

feet of 2 inch pipe. What is their total weight?

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6. Bo compares 1 1/4 and 2 1/2 inch pipe. What is the difference in their diameters?

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7. Bo gets 10 feet of pipe. It weighs 11.30 pounds. What size pipe is it?

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8. Bo has 100 feet of 1 1/4 inch pipe. He has 50 feet of 2 1/2 inch pipe. What is the difference in their weights?

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9. Bo rigs a load for 500 pounds. He must move 150 feet of 2 1/2 pipe. How much is the pipe's weight over the limit?

10. Bo orders 100 feet of 1 1/4 inch pipe. He receives 100 feet of 1 1/2 inch pipe. What is the difference in their weights?

STEEL PIPE WEIGHTS

Standard

Nominal Size in Inches	Weight, lb.per ft.
1/2	0.85
3/4	1.13
1	1.68
1 1/4	2.27
1 1/2	2.72
2	3.65
2 1/2	5.79

COPPER TUBING

Weight

Nominal Size In Inches	Type K lb. per ft.	Type L lb. per ft.	Type M lb. per ft.
1/2	0.344	0.285	0.204
1	0.839	0.655	0.465
1 1/2	1.625	1.360	1.140
2	2.125	2.060	1.460
2 1/2	2.625	2.930	2.030
3	3.125	4.000	2.680
3 1/2	3.625	5.120	3.580
4	4.125	6.510	4.660

LATHE CUTTING SPEEDS

Material	Rough Cut Ft. per Min.	Finish Cut Ft. per Min.
Aluminum	200-400	300-500
Brass	100-200	200-300
Bronze	60-90	100-125
Cast Iron	60-70	80-100
Steel Alloy	50-60	60-90

LATHE FEED RATES

Material	Rough Cut in Inches	Finish Cut in Inches
Aluminum	0.015-0.020	0.002-0.005
Brass	0.010-0.020	0.002-0.005
Bronze	0.010-0.020	0.002-0.005
Cast Iron	0.015-0.025	0.003-0.010
Steel Alloy	0.005-0.015	0.002-0.005

DIMENSIONS OF STEEL FISH WIRE

Width	Thickness	Weight per 100 ft.
1/8	0.015	11 oz.
3/16	0.030	1 lb. 14 oz.
1/4	0.030	2 lb. 8 oz.
5/16	0.035	3 lb. 8 oz.
3/8	0.035	3 lb. 12 oz.

PROPERTIES OF FLEXIBLE TUBING OR LOOM

Inside diameter, in.	Outside diameter, in.	Ft. per coil	Weight lb/1000 ft.
1/4	1/2	250	58
1/2	25/32	200	90
3/4	1 1/16	150	196
1	1 5/16	100	250
1 1/4	1 41/64	100	400
1 1/2	1 57/64	odd lengths	480
1 3/4	2 1/4	odd lengths	590
2	2 41/64	odd lengths	800
2 1/4	2 13/16	odd lengths	810

RIGID CONDUIT

(General Electric Co)

Size in.	Weight, lb/ 1000 ft	Ft. per Bundle	External Diameter, In
1/2	855	100	0.900
3/4	1119	50	1.110
1	1701	50	1.375
1/1/4	2247	30	1.720
1/1/2	2688	10	1.960
2	3601	10	2.435
2 1/2	6132	10	2.935
3	7860	10	3.560
3 1/2	9433	10	4.060

DIMENSIONS OF LIQUIDTIGHT FLEXIBLE METAL CONDUIT

Conduit Size	Inside Diameter	Outside Diameter
3/8	0.484	0.690
1/2	0.622	0.820
3/4	0.820	1.030
1	1.041	1.290
1 1/4	1.380	1.630
1 1/2	1.560	1.870
2	2.005	2.335
2 1/2	2.449	2.855
3	3.048	3.480

STANDARD CONDUIT

Dimensions of Threads

Conduit Inch Size	# Threads per Inch	Inch Length of Threads
1/2	14	0.78
1	11 1/2	0.98
1 1/2	11 1/2	1.03
2	11 1/2	1.06
2 1/2	8	1.57
3	8	1.63
3 1/2	8	1.68
4	8	1.73

ALUMINUM RIGID CONDUIT COUPLINGS

Trade Size in inches	Outside Diameter,in	Length in Inches	Weight /100 pieces, lb.
1	1 9/16	2.00	12.5
2	2 3/4	2.12	34.6
3	3 15/16	3.25	91.4
4	5	3.50	142.0
5	6 7/32	3.75	241.9
6	7 5/16	4.00	321.0

ALUMINUM RIGID CONDUIT COUPLINGS

Trade Size in inches	Outside Diameter,in	Length in Inches	Weight /100 pieces, lb.
1	1 9/16	2.00	12.5
2	2 3/4	2.12	34.6
3	3 15/16	3.25	91.4
4	5	3.50	142.0
5	6 7/32	3.75	241.9
6	7 5/16	4.00	321.0

CASING NAIL SIZES

(American Steel and Wire Co)

Size	Length, in	Gage	# per lb.
2d	1	15 1/2	1010
3d	1 1/4	14 1/2	635
3 1/2d	1 3/8	----------	----------
4d	1 1/2	14	473
5d	1 3/4	14	406
6d	2	12 1/2	236
7d	2 1/4	12 1/2	210
8d	2 1/2	11 1/2	145
9d	2 3/4	11 1/2	132

ELECTRICAL METALLIC TUBING

Size, inches	Weight per 1000 ft, lb	Inside Diameter, in	Outside Diameter, in	Wall thickness, in
1/2	295	0.622	0.706	0.042
3/4	445	0.824	0.922	0.049
1	650	1.049	1.163	0.057
1 1/4	960	1.380	1.510	0.065
1 1/2	1110	1.610	1.740	0.065
2	1410	2.067	2.197	0.065
2 1/2	2300	2.731	2.875	0.072
3	2700	3.356	3.500	0.072
4	4000	4.334	4.500	0.083

251. Anchor Selection Chart by Type of Material
(The Rawlplug Co., Inc.)

	Rawl-plug	Saber-tooth	Multi-calk	Calk-in	Rawl-drive	H/S drop-in	Double	Lag shield	Nailin	Spring-wing	Rawly
Brick		•	•	•	•	•		•	•		
Concrete		•	•	•	•	•	•	•	•		
Concrete block						•			•	•	•
Cinder block						•				•	•
Stone	Use in any masonry material	•	•	•	•	•	•		•		
Marble		•		•		•			•		
Building tile						•				•	•
Ceramic tile						•				•	•
Terrazzo		•		•		•			•		
Terra cotta						•				•	•
Plaster										•	•
Dry wall										•	•
Slate						•					•
Stucco											
Glass											

DATA FOR RAWL-DRIVES

In. Diam of Bolt & Drill	In. Length of Bolt	Rawldrill # or size	Packed in Boxes of	Weight, lb./ 100 Bolts
3/16	1	#10	100	1 3/4
1/4	1 1/4	#12	100	3
5/16	1 1/2	#16	50	6
3/8	3	#20	25	13
1/2	3	1/2 in.	25	25

GRADES OF STAINLESS STEEL

Nominal Thicknesses in Inches According to Schedule

PIPE SIZE	SCHEDULE 10S	SCHEDULE 40S	SCHEDULE 80S
1	0.109	0.133	0.179
2	0.109	0.154	0.218
3	0.120	0.216	0.300
4	0.120	0.237	0.337
5	0.134	0.258	0.375
6	0.134	0.280	0.432
8	0.148	0.322	0.500
10	0.165	0.365	0.500
12	0.180	0.375	0.500

DUCTILE IRON PIPE

WALL THICKNESSES IN INCHES

SIZE	CLASS 50	CLASS 51	CLASS 52	CLASS 53	CLASS 54
3	--------	0.25	0.28	0.31	0.34
4	--------	0.26	0.29	0.32	0.35
6	0.25	0.28	0.31	0.34	0.37
8	0.27	0.30	0.33	0.36	0.39
10	0.29	0.32	0.35	0.38	0.41
12	0.31	0.34	0.37	0.40	0.43
14	0.33	0.36	0.39	0.42	0.45
16	0.34	0.37	0.40	0.43	0.46
18	0.35	0.38	0.41	0.44	0.47
20	0.36	0.39	0.42	0.45	0.48

MAXIMUM SAFE WORKING LOADS

in pounds

WEB WIDTH (Inches)	SINGLE VERTICAL HITCH	SINGLE CHOKER HITCH	SINGLE BASKET HITCH
1	1600	1200	3200
2	3200	2400	6400
3	4800	3600	9600
4	6400	4800	12800
5	8000	6000	16000
6	9600	7200	19200
7	11200	8400	22400
8	12800	9600	25600
9	14400	10800	28800
10	16000	12000	32000

REINFORCED CONCRETE CULVERT, STORM DRAIN, & SEWER PIPE

ASTM C 76, Bell and Spigot Joint, Wall A

Inside diameter, in.	Wall thickness, in.	Avg. lb/ft
12	1 3/4	90
15	1 7/8	120
18	2	155
21	2 1/4	205
24	2 1/2	265
27	1 5/8	310
30	2 3/4	363

REINFORCED CONCRETE ELLIPTICAL CULVERT, STORM DRAIN, & SEWER PIPE

ASTM C 507

Equiv. Round Size, Inches	Minor Axis, Inches	Major Axis, Inches	Wall Thick-ness, Inches	Weight lb/ft
18	14	23	2 3/4	195
24	19	30	3 1/4	300
30	24	38	3 3/4	430
36	29	45	4 1/2	625
42	34	53	5	815
48	38	60	5 1/2	1000
54	43	68	6	1235
60	48	76	6 1/2	1475
66	53	83	7	1745
72	58	91	7 1/2	2040

STEEL PIPE WEIGHTS

Extra Strong

Nominal Size in Inches	Weight, lb.per ft.
1/4	0.54
1/2	1.09
3/4	1.47
1	2.17
1 1/4	3.00
1 1/2	3.63
2	5.02
2 1/2	7.66